

A DEMONSTRATION OF FRACTAL GEOMETRY IN THE MANDLEBROT SET

We discuss in class the fractal nature of the evolutionary record, and will explore this fractal nature in a number of ways. We are also going to tie fractal geometry in with chaos and complexity theory and the driving forces of evolution. But I want you to run a simple demonstration of fractal geometry to see, and come to understand it for yourself.

TIMING AND COMPUTER LOCATIONS: This exercise will take you 15 - 20 minutes. The program is on the computers in Miller Hall, Room 224

PROCEDURES:

- Click on the 'Alife' icon on the desktop and double click any of the program icons to open the program. If the program will not load, Go To: Start, Shutdown, "Close all programs and logon as new user." A new logon screen with "geolstud" will appear. Just click "OK" and you will be logged on to the server with the programs.
- Once you have the "Alife" desktop open, find the icon called "Enter the Complexity Lab" and double click on it.
 - ☞ Find the "Mandel 3.0" icon and double click on it. That brings up the Mandelbrot screen.
 - ☞ If you want, expand the Mandelbrot window to fill the screen by clicking the little up arrow in the upper right corner of the Mandelbrot window.
- To begin, just take the mouse, ① put the pointer on the screen somewhere, ② click and hold the left mouse bottom and drag a box around a part of the screen, ③ let go. The computer will calculate an enlargement of the portion you selected and fill the screen with it. ④ Repeat steps ① through ③ until the computer gives you an error message. That means it has calculated to the farthest decimal point it can go. The Mandelbrot set goes on infinitely.
 - ☞ To start over, do a FILE: EXIT and then re-click the Mandel 3.0 icon.

EXERCISE:

- Try this, take the mouse:
 - ① Put the pointer on the screen somewhere.,
 - ② Click and hold the left mouse button and drag a box around a part of the screen.
 - ③ Let go, and click Zoom in the dialogue box which appears.The computer will calculate an enlargement of the portion you selected and fill the screen.
 - ④ Repeat steps ① through ③ until the computer gives you an error message. That means it has calculated to the farthest decimal point it can go. The Mandelbrot set goes on infinitely.
 - ☞ To start over, do a File: Exit (or click the "X" in the upper right) and then re-click the Mandel icon.

EXERCISE:

- A Get to a new Mandelbrot screen (File: Exit and then double click the Mandel icon).
- B Choose some specific portion of the set and observe its shapes (make a sketch).
- C Follow steps ① through ④ in the Procedures, carefully observing what happens to the shapes as they are progressively enlarged.
- Repeat steps A - C for four or five distinctly different areas of the set. Some may be very boring, some very interesting. On the Record Pages keep notes on your observations, trying to describe as accurately and precisely as you can what you observe.

- RECORD THE OUTCOMES OF YOUR EXPERIMENTAL RESULTS ON THE DATA SHEET ON THE NEXT PAGE



Name: _____

1: FRACTAL GEOMETRY IN THE MANDELBROT SET

- In the spaces provided below write statements in your own words describing:
- 1 - What you observe happening in each of your experimental runs (make sketches).
 - 2 - What is meant by fractal geometry.

MANDELBROT SET RUN ONE:

MANDELBROT SET RUN TWO:

MANDELBROT SET RUN THREE:

MANDELBROT SET RUN FOUR:

WRITE A STATEMENT DESCRIBING WHAT FRACTAL GEOMETRY IS:

